SB9

PT5 Video Decoder

Evaluation Board

User Manual

Revision 0.1
18th July 2015

Revisions

Date	Revisions	Version
18-07-2015	First draft	0.1

Contents

Figures

Introduction

SB9 is an evaluation platform for the SingMai PT5 video decoder IP core.

The video source is CVBS analogue video (NTSC or PAL) at standard resolution, 960H or 1280H formats. The source is amplified and clamped before driving a 12 bit analogue to digital converter. The converter is sampled at 54MHz (NTSC/PAL and 1280H) or 36MHz (960H format). The digital composite video is then decoded in the PT5 using a proprietary adaptive 3D comb filter and then formatted to a BT656 output which drives an SDI serialiser (NTSC/PAL only) and a digital to analogue converter which converts the digital component output to YPbPr (960H/1280H only).

A simple switch control allows the selection of the input format.

SB9 requires 5VDC which is provided via the supplied AC-DC converter.

Warning

The PT5 is copy protected.

The IP core will not run, even with a cloned design and a copy of the FPGA bit map, because of the custom anti-copying device on the SB9.

Quick start guide

A plan view of the SB9 board is shown in Figure 1.

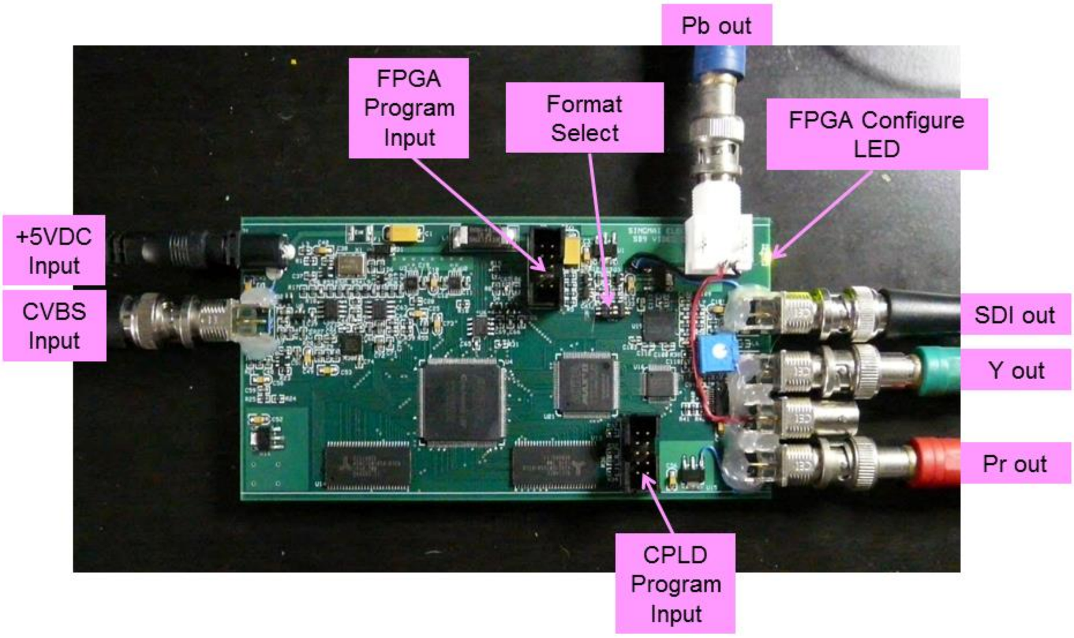


Figure 1 SB9 evaluation board overview.

SB9 requires a 5VDC supply which is provided via the supplied AC-DC adaptor. The adaptor accepts AC between 100 and 240VAC – the full specification is provided in Appendix A.

Connect the 5VDC jack from the adaptor to the +5VDC socket on the SB9. The green 'FPGA Configured' LED should light showing the FPGA has been configured successfully.

Connect an NTSC or PAL composite video input to the 'CVBS Input' BNC.

For Standard PAL/NTSC inputs the 'SDI out' BNC provides the output.

For 960H or 1280H operation the 'YPbPr out' BNCs provide the output.
(The SDI standard only allows 27MHz sampling which does not permit the higher sampling/bandwidth of the 960H and 1280H standards to be output.)

To select between the video formats set the switch as shown in Figures 2 and 3.

Switching between PAL and NTSC standards for all formats is done automatically based on the number of lines/field that are detected.

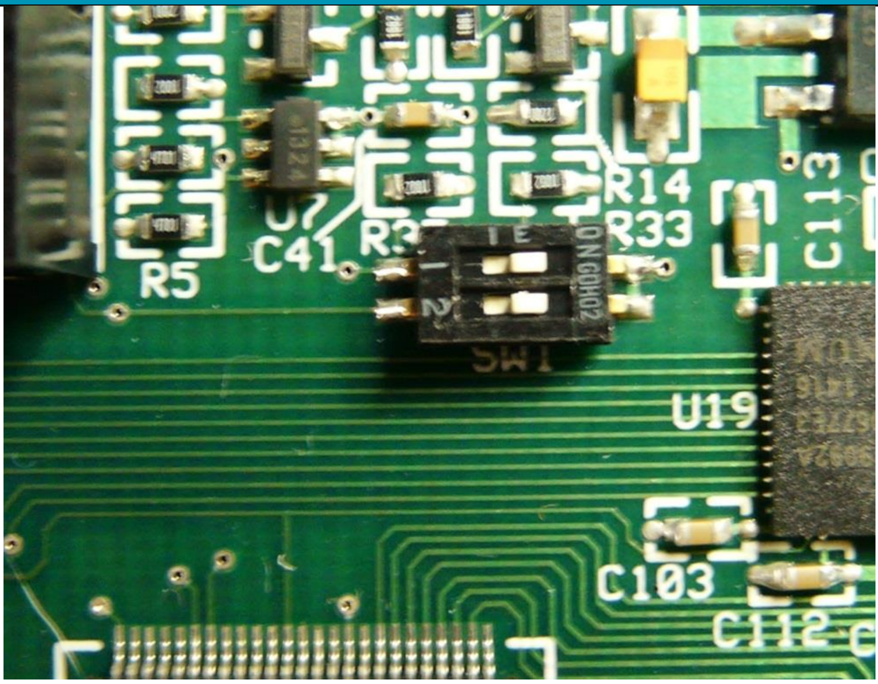


Figure 2 Format setting (shown for NTSC/PAL, 27MHz output clock).

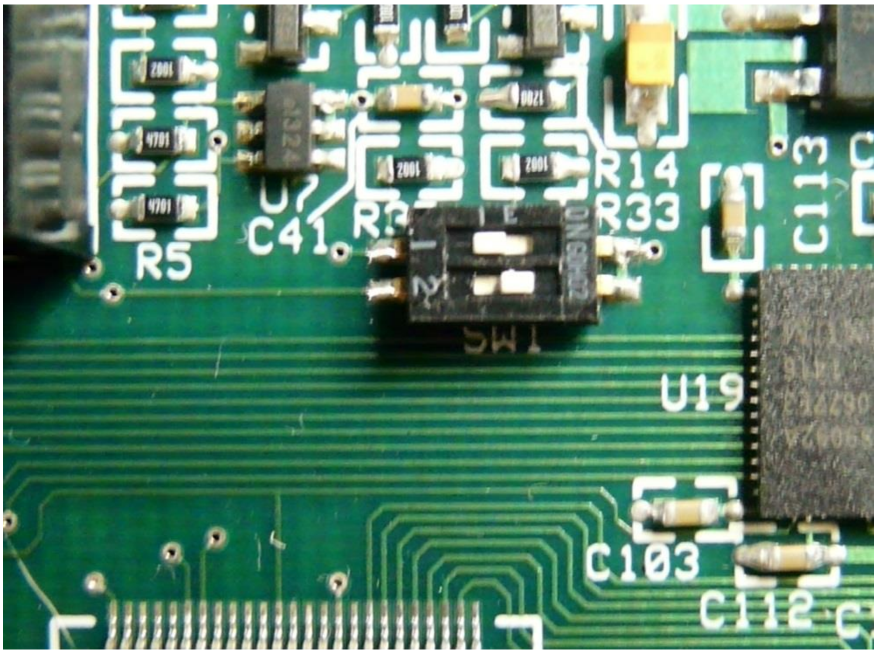


Figure 3 Format setting (shown for NTSC/PAL-1280H, 54MHz output clock).

Re-programming the FPGA

It may be necessary to reprogram the FPGA to demonstrate any customization to the PT5 IP core. As the SB9 uses an Altera FPGA it is necessary to download the Quartus programmer software (free from the Altera website: https://wl.altera.com/download/software/prog-software/12.1).

Also it is necessary to use the USB-Blaster module, also from Altera (or similar from other companies): http://www.buyaltera.com/scripts/partsearch.dll?Detail&name=544-1775-ND.

The USB-Blaster 10-way header plugs into J3, the 10W header on the SB9. The header is polarized to ensure the cable cannot be inserted the wrong way (see Figure 4).

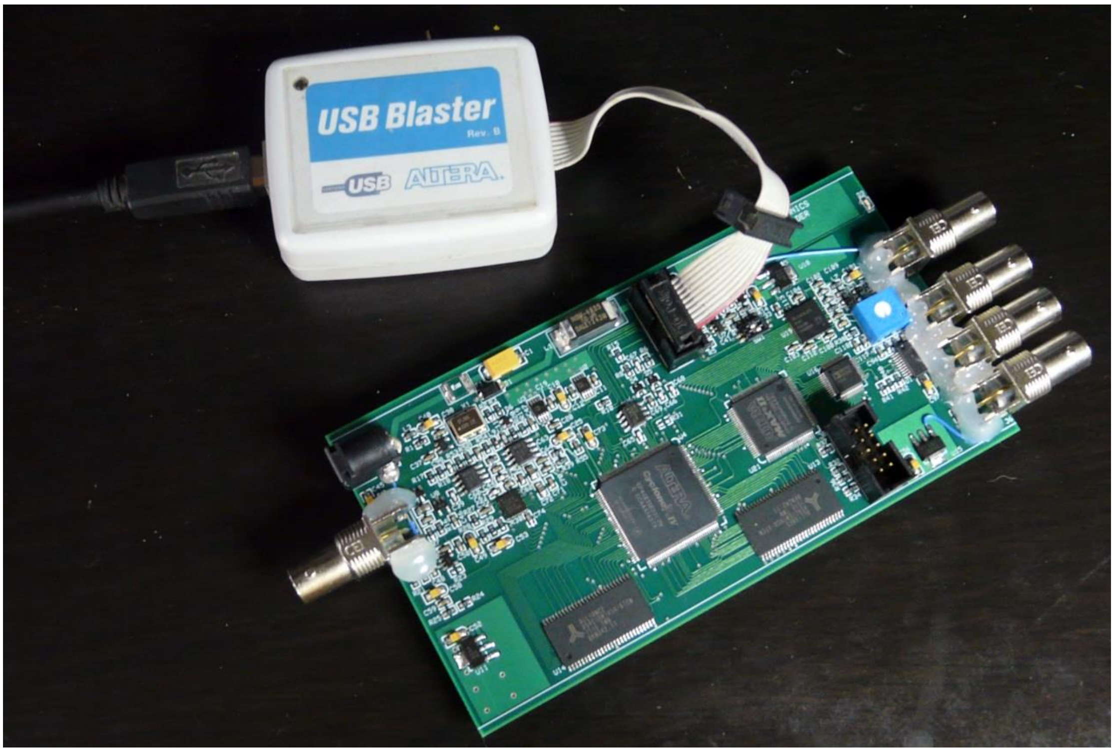


Figure 4 Re-programming the SB9.

Install and open the Quartus programmer. The screen should look similar to Figure 5.

The new FPGA image will be sent as a file called SB9.pof. Set the programming mode to ‘Active Serial Programming’. If everything is OK the programmer should recognize the serial EEPROM (shown as EPCS4). Click the ‘Add File’ button and point to the SB9.pof file. Click the check box ‘Program/Configure’ and click the ‘Start’ button. You should see the progress bar move as the device is programmed. If successful the bar will show 100% (Successful) after programming is complete.

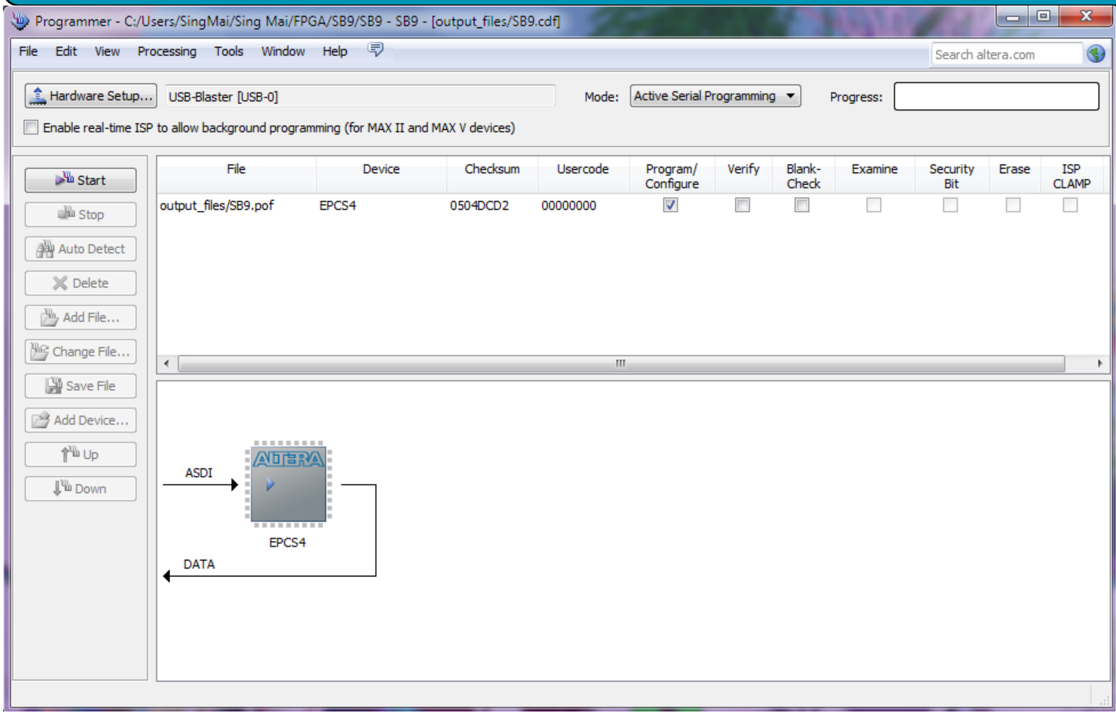


Figure 5 Quartus FPGA programmer.

Technical Overview

The 5VDC input is filtered and linear regulators generate the required local supplies.

The PT5 video encoder IP core is run on an Altera 4CE15 FPGA. The FPGA is configured using a pre-programmed EEPROM.

The input to the PT5 is composite analogue NTSC/PAL encoded video. The video input is buffered, filtered, amplified and clamped to the sync tip bottom (black level clamping is performed by the PT5). This signal is then converted to digital composite video using a 12 bit ADC sampled at 54MHz. (For standard NTSC/PAL this is decimated to 27MHz in a low pass filter).

The clock for the PT5 is provided by a voltage controlled oscillator which is controlled from a an output from the PT5.

An SDRAM controller in the FPGA provides the frame delays for the 3D comb filter, together with two 16Mb x 16 SDRAMs.

The output from the PT5 is formatted to a BT656 output (for standard NTSC/PAL) which drives a Gennum SDI serialiser.

If 960H or 1280H format is selected the BT656 output is over-clocked at either 36MHz or 54MHz. In this case a CPLD separates the video into YCbCr outputs to drive a triple DAC which is then buffered and filtered to provide a YPbPr output. The CPLD also generates a composite sync signal which is added to the Y output.

The PT13 IP core (compact microprocessor) provides the control for the board, reading the switch status and controlling the PLLs and PT5.

Appendix A: AC-DC adaptor

The specification for the supplied AC-DC adaptor is shown in Figures 6 and 7.

MENB1010

Universal 10 Watt Series

Medical Switch-Mode Power Supply — **3 Year Warranty**

SL POWER ELECTRONICS

- *100-240Vac Universal Input Range*
- *Meets EISA2007, CEC Efficiency Level V, EU (EC) No 278/2009 Phase II*
- *Desktop & Wall Plug Styles*
- *5V to 24V Single Output Models, up to 12W*
- *Modified and Custom Designs Available*
- *Regulated Output with Low Ripple*
- *Impact-Resistant Polycarbonate Enclosure*
- *No load Power Consumption <0.3W*
- *Limited Power Source*
- *Certified to UL/EN/IEC60601-1, 3rd Edition, 2xMOPP Isolation*



c UL us CE RoHS V AULT

Specifications — *All Specifications are typical at nominal input, full load at 25°C unless otherwise stated.*

AC Input	100-240Vac, -/-10%, 47-63 Hz, 1Ø	**MTBF**	>100,000 hours (calculated)
Input Current	100Vac: 0.27A	**Hold-up Time**	18 mS min. @ 115Vac, 60 mS min. @ 230 Vac
Inrush Current	60 A peak max at 264 Vac	**Overload Protection**	Hiccup Mode
Input Fuse	Internal Primary Current Fuse provided (1A, 250Vac rated)	**Short Circuit Protection**	Hiccup Mode
Efficiency	Meets EISA2007, CEC Efficiency Level V, EU (EC) No 278/2009 Phase II	**Topology**	Switching – Fixed Frequency Flyback
Output Voltage	See chart	**Safety Standards**	EN/IEC/CSA/UL60601-1, 3rd Edition
Output Power	See chart	**EMC, Radiated & Conducted**	See Chart below
Ripple and Noise	1% pk-pk max., 20MHz BW	**Dielectric Withstand**	Input-Output: 2 MOPP, Input-Ground: 1 MOPP, Output-Ground: 500Vac
Line & Load Voltage Regulation	Line: +/- 1%, Load: +/-5%	**Operating Temperature**	0° to 40°C, no derating
Minimum Load	Not required	**Storage Temperature**	-30 to +85°C
Case Material	Black 94V-0 Polycarbonate	**Relative Humidity**	5% to 95%, non-condensing
Case Dimensions	84 x 47 x 32mm. See outline drawing	**Operating Altitude**	-500 to 10,000 ft
Weight	110g	**Non-operating Altitude**	-500 to 40,000 ft
Output Cable	#20AWG (UL2468), 1500mm, 2 conductor	**Output Connector**	2.5mm barrel type (Ault #3), center contact (+) Other options available, contact the factory for details

EMC Specifications

Conducted Emissions	EN55011 Class B, FCC Part 15, Class B.
Radiated Emissions	EN55011 Class B, FCC Part 15, Class B.
Line Frequency Harmonics	EN61000-3-2, Class A
Voltage Fluctuations/Flicker	EN61000-3-3
Static Discharge Immunity	EN61000-4-2, 6kV Contact Discharge, 8kV air discharge
Radiated RF Immunity	EN61000-4-3, 3V/m.
EFT/Burst Immunity	EN61000-4-4, 2kV/5kHz.
Line Surge Immunity	EN61000-4-5, 1kV differential, 2kV common-mode
Conducted RF Immunity	EN61000-4-6, 3Vrms
Power Frequency Magnetic Field Immunity	EN61000-4-8, 3A/m
Voltage Dip Immunity	EN61000-4-11, Criteria A

1 of 2

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Figure 6 AC-DC adaptor specification- Page 1.

MENB1010

Universal 10 Watt Series

Medical Switch-Mode Power Supply — *3 Year Warranty*

Model Number	Volts (V)	Output Current (max)	Max Watts	Ripple (Vp-p max)
MENB1010A0503F01	5 V	2.00 A	10.0 W	50 mV
MENB1010A0603F01	6 V	2.00 A	12.0 W	60 mV
MENB1010A0703F01	7.5 V	1.60 A	12.0 W	75 mV
MENB1010A0903F01	9 V	1.10 A	10.0 W	90 mV
MENB1010A1203F01	12 V	1.00 A	12.0 W	120 mV
MENB1010A1503F01	15 V	0.80 A	12.0 W	150 mV
MENB1010A1603F01	16 V	0.75 A	12.0 W	160 mV
MENB1010A1803F01	18 V	0.67 A	12.0 W	180 mV
MENB1010A2403F01	24 V	0.50 A	12.0 W	240 mV
MENB1010A4803F01	48 V	0.25 A	12.0 W	480 mV

Notes: Part numbers above include #3 output connector and IEC320 C14 grounded input receptacle. See below for other options.

Model Number Key

MENB 1 010 A VV 03 F 01

Model	"01" = Standard. "02" and higher indicates a modified model.
Input Connector:	"F" = IEC320 C14 grounded, Other options available, see below
Output Connector:	"03" = 2.5mm Barrel Type Connector. Other options available, contact factory.
Output Voltage:	"05" = 5Vdc, "12" = 12Vdc, "24" = 24Vdc, etc.
Model	"A" = Original Configuration
Output Power:	"010" = 10 Watts
# of Outputs	"1" = Single Output
Product Family:	"M" = Medical, "E" = External, "NB" = Model Series Designator

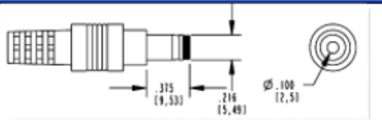
AC Input Receptacle Options



Desktop			Wall-Plug				
IEC320 - C14 Class I Grounded (F)	IEC320 - C18 Class II Ungrounded (Q)	IEC320 - C8 Class II "Shaver" (N)	N. America Japan Interchangeable (B)	N. America Japan Fixed (C)	Europe Fixed (M)	United Kingdom Fixed (G)	Australia Fixed (H)

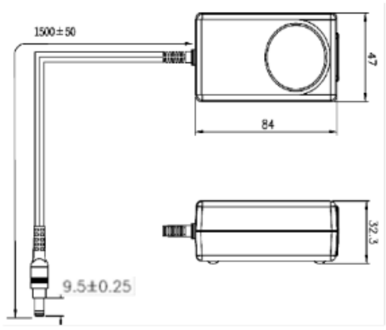
Notes:
1. For desktop options, choose applicable letter above.
2. For Wall-Plug options, choose the applicable letter above and the unit will be fitted with the receptacle chosen. The N. A. blade version (B) will be an interchangeable blade. The other options (C), (M), (G), and (H) will be fixed blades molded in the case.
3. Blade Kit is available which will include one each of a EU, UK, and Australian blade. Kit part # is KT1027K. These can be used with the (B) version, to allow blades to be changed.

Output Connector

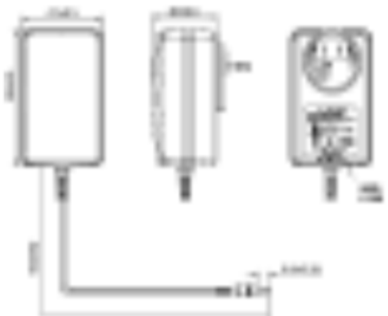


Notes:
1. Ault #3 Connector, center contact (+).
2. Connector is Switchcraft 760 plug or equivalent. Mating connector is Switchcraft 712A or equivalent.
3. Other connector options are available. Contact your local SL Power Representative for details.

Outline Drawings



Desktop Style



Wall-Plug Style (Option "B" Shown)

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Figure 7 AC-DC adaptor specification- Page 2.

Appendix B: SB9 Schematics

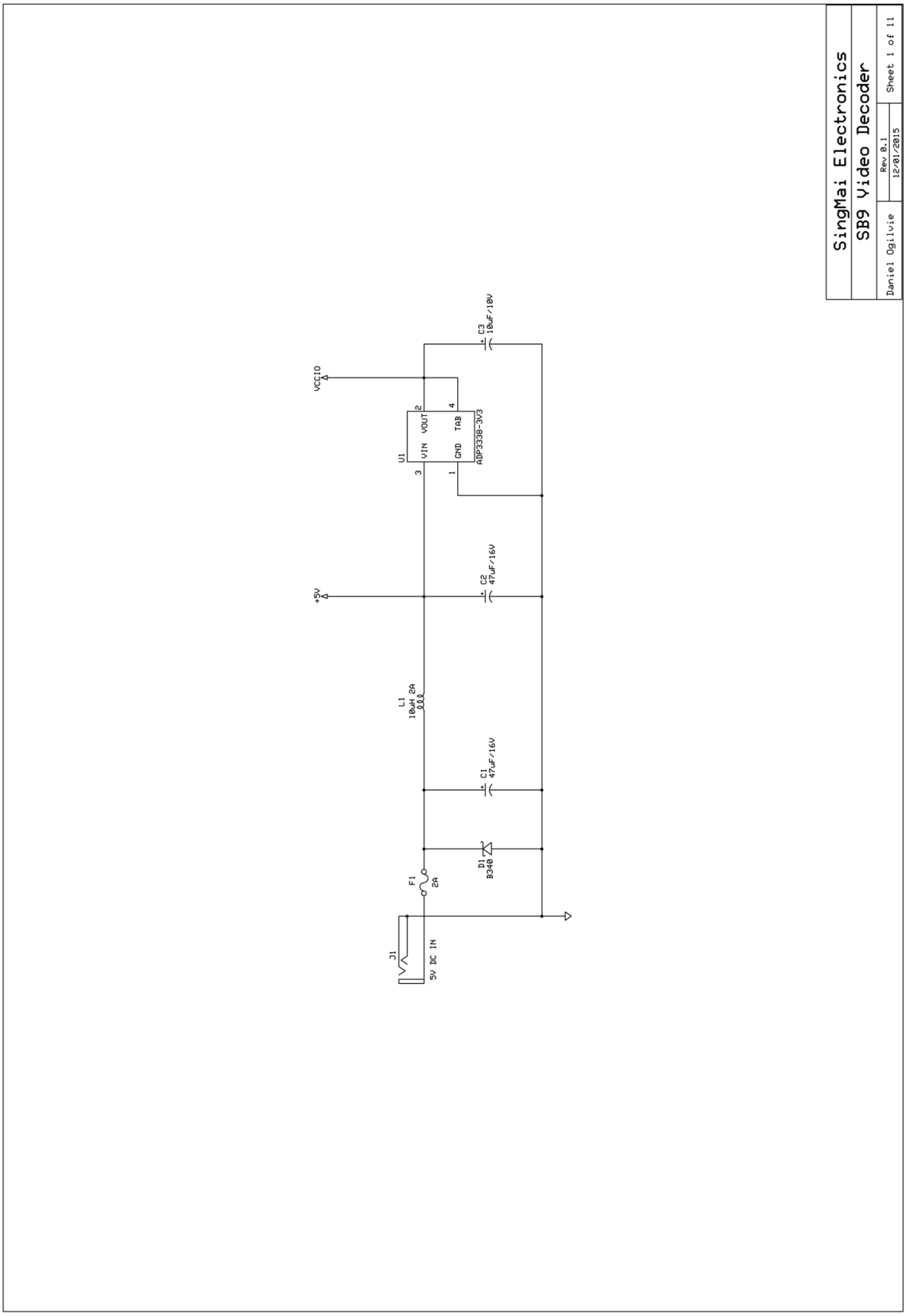


Figure 8 SB9 schematics - sheet 1.

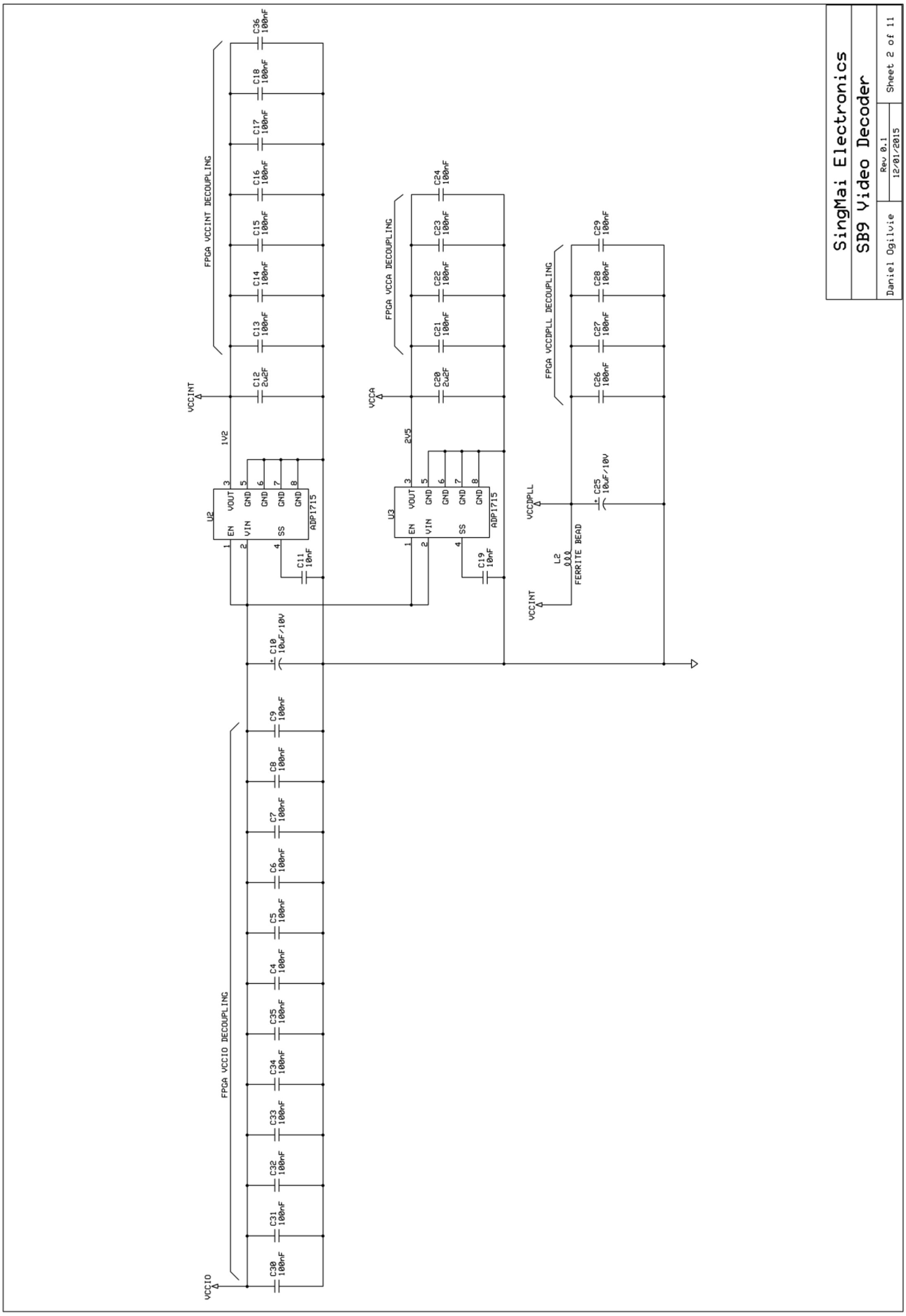


Figure 9 SB9 schematics - sheet 2.

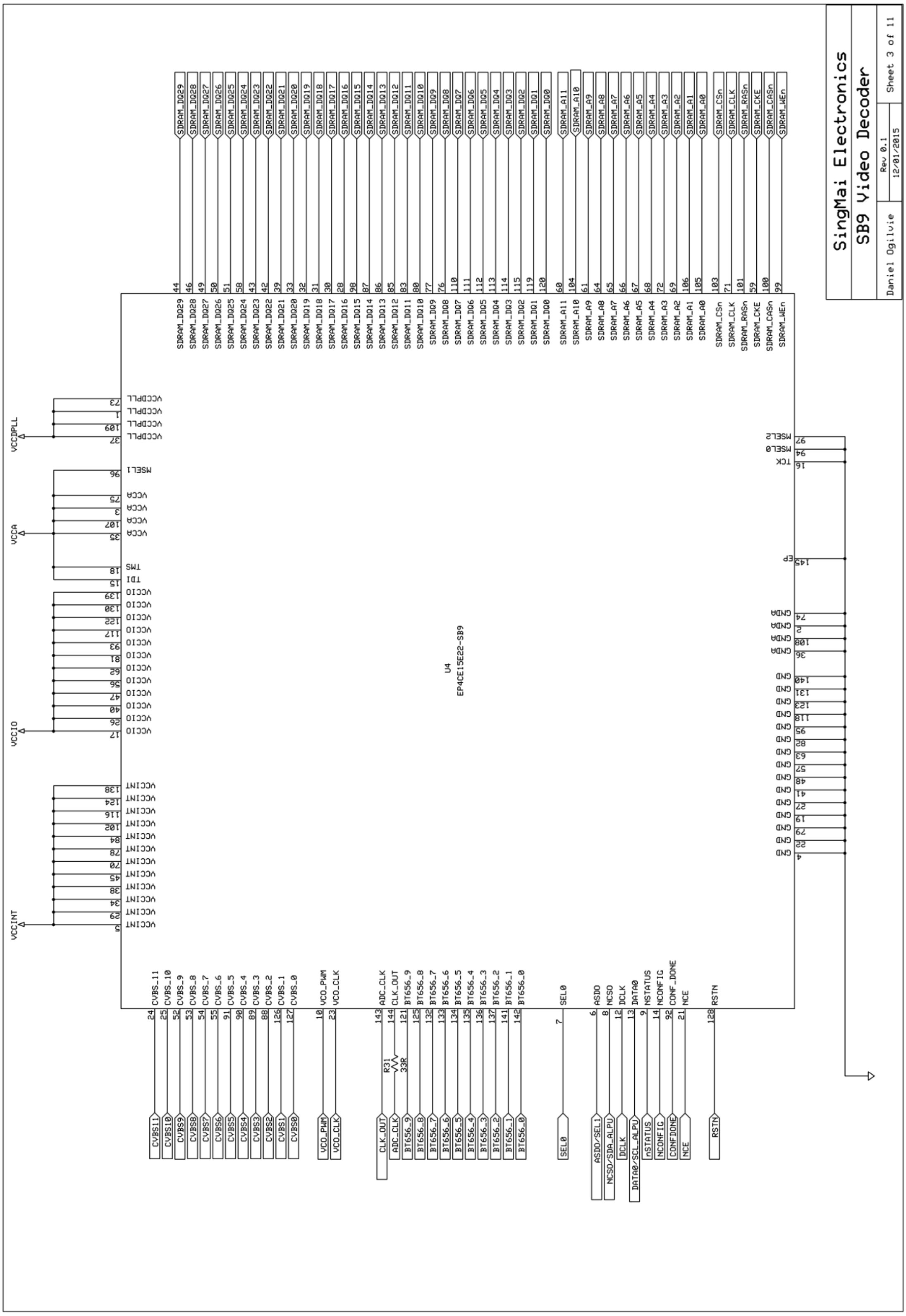


Figure 10 SB9 schematics - sheet 3.

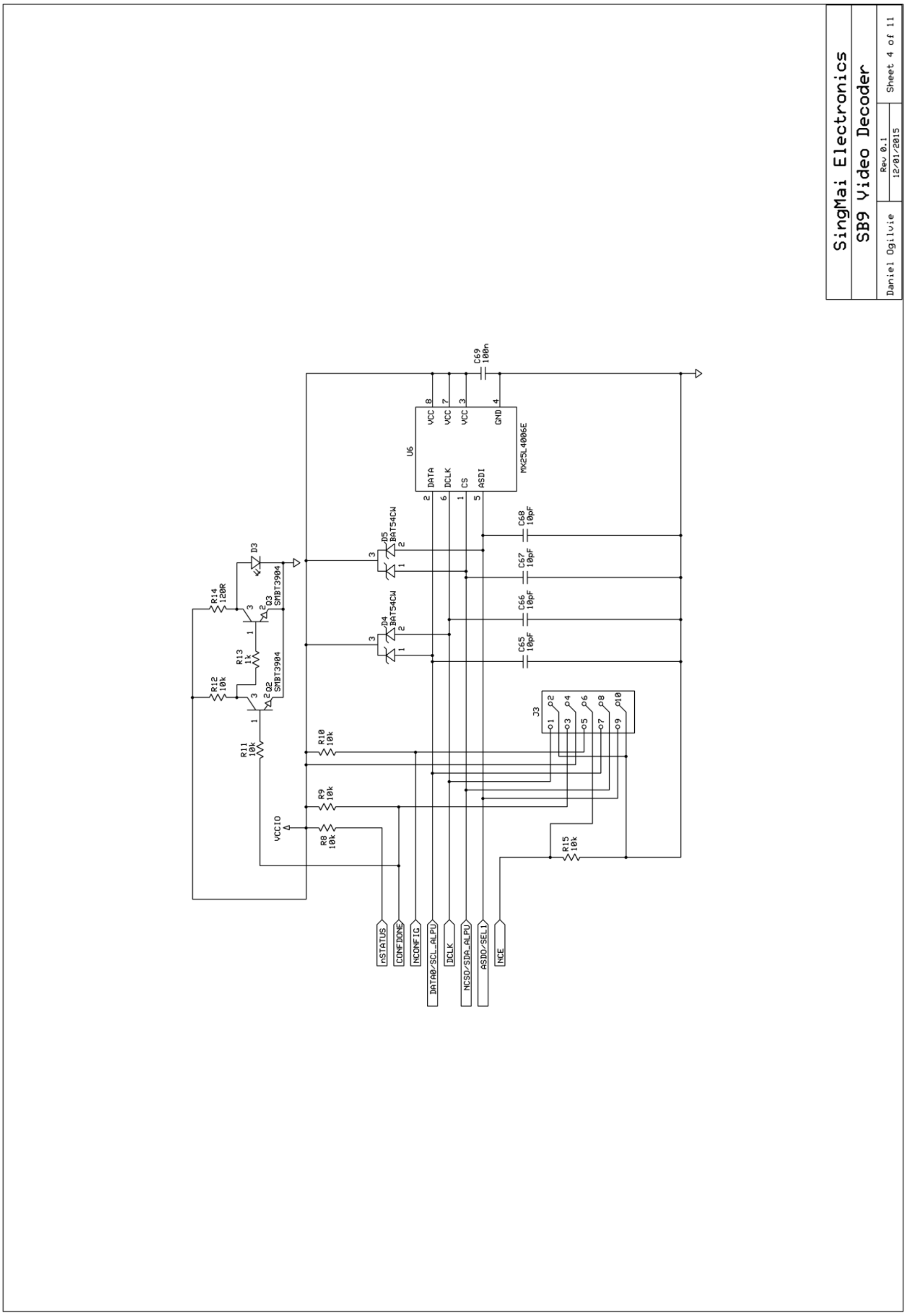


Figure 11 SB9 schematics - sheet 4.

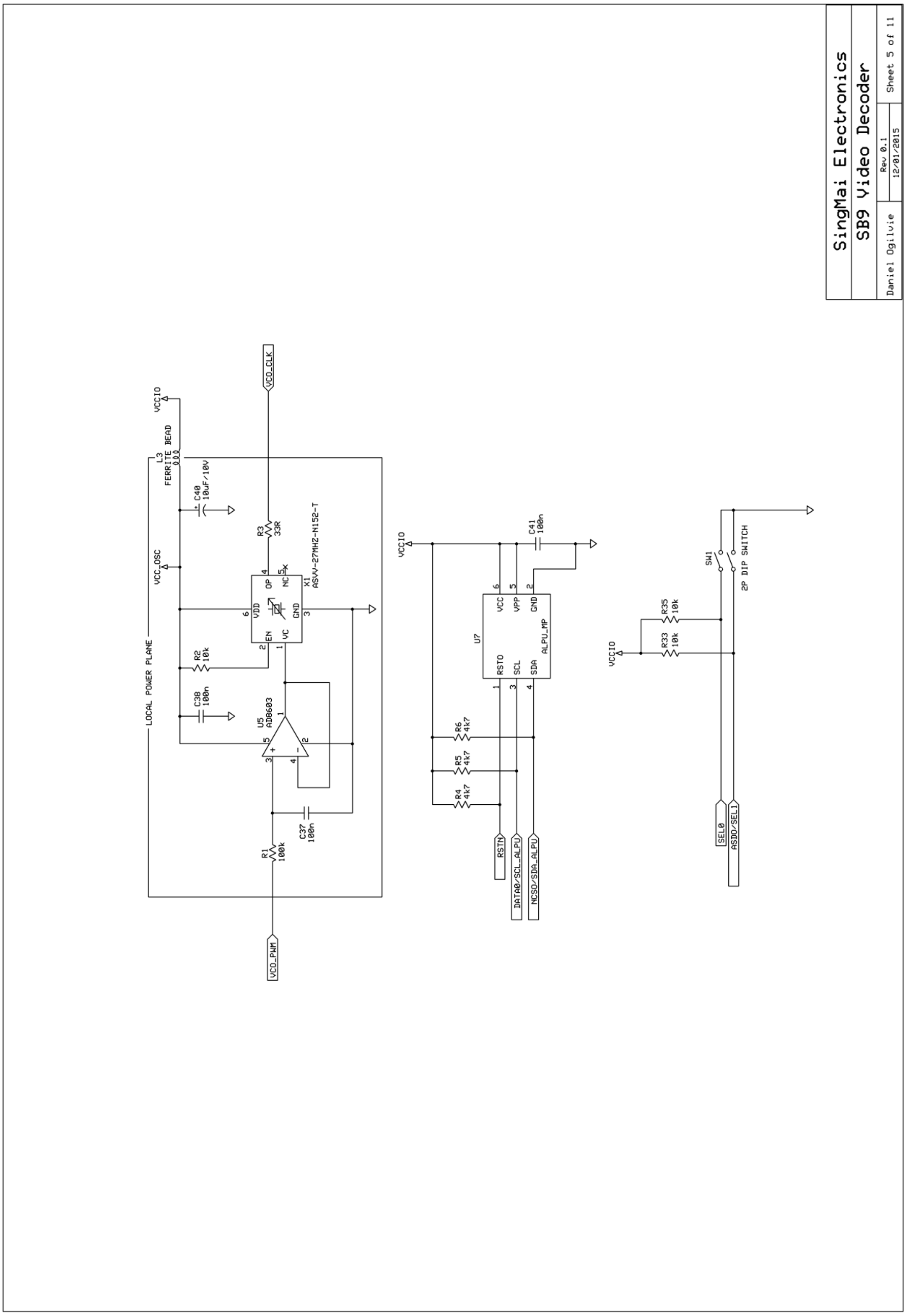


Figure 12 SB9 schematics - sheet 5.

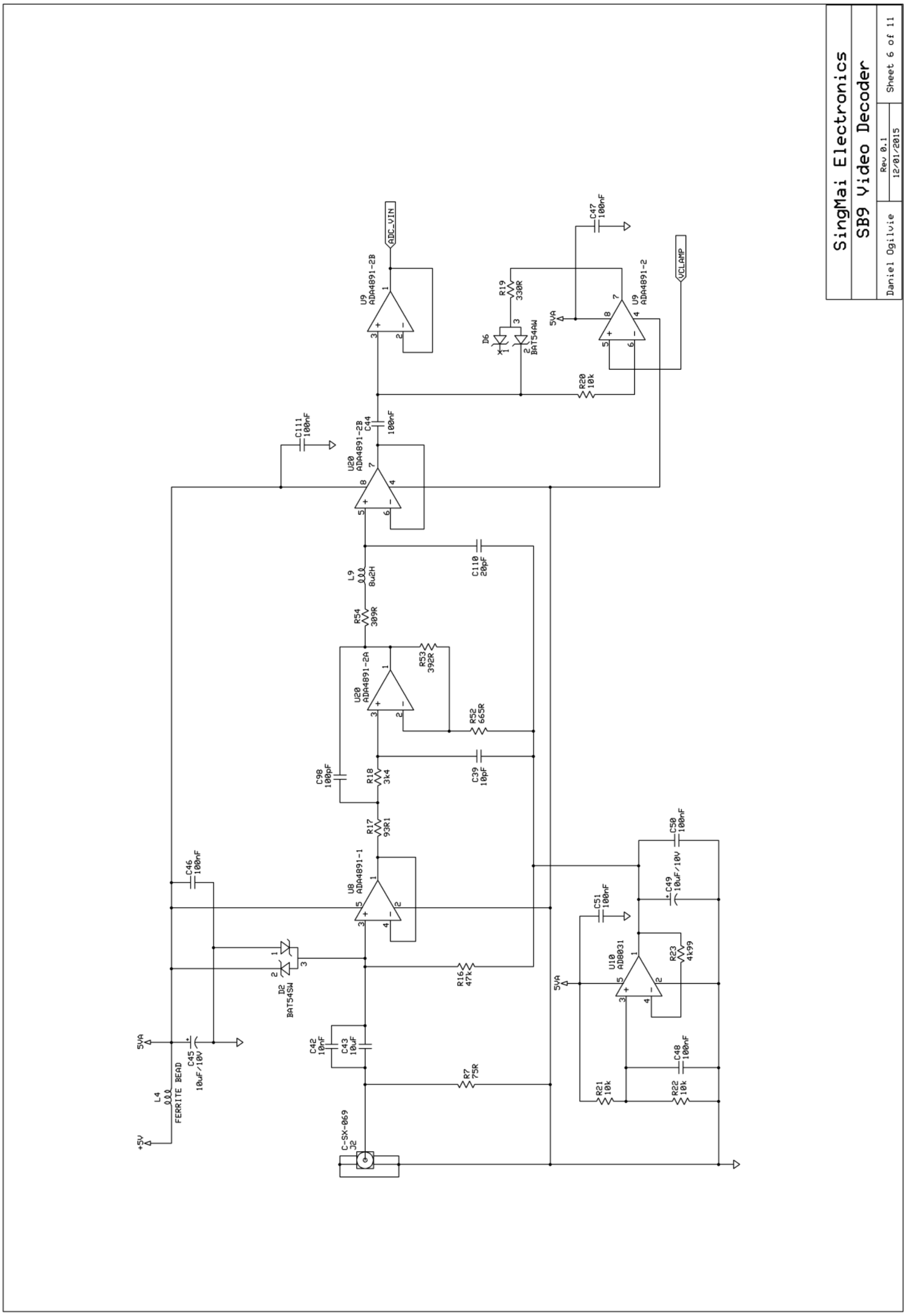


Figure 13 SB9 schematics - sheet 6.

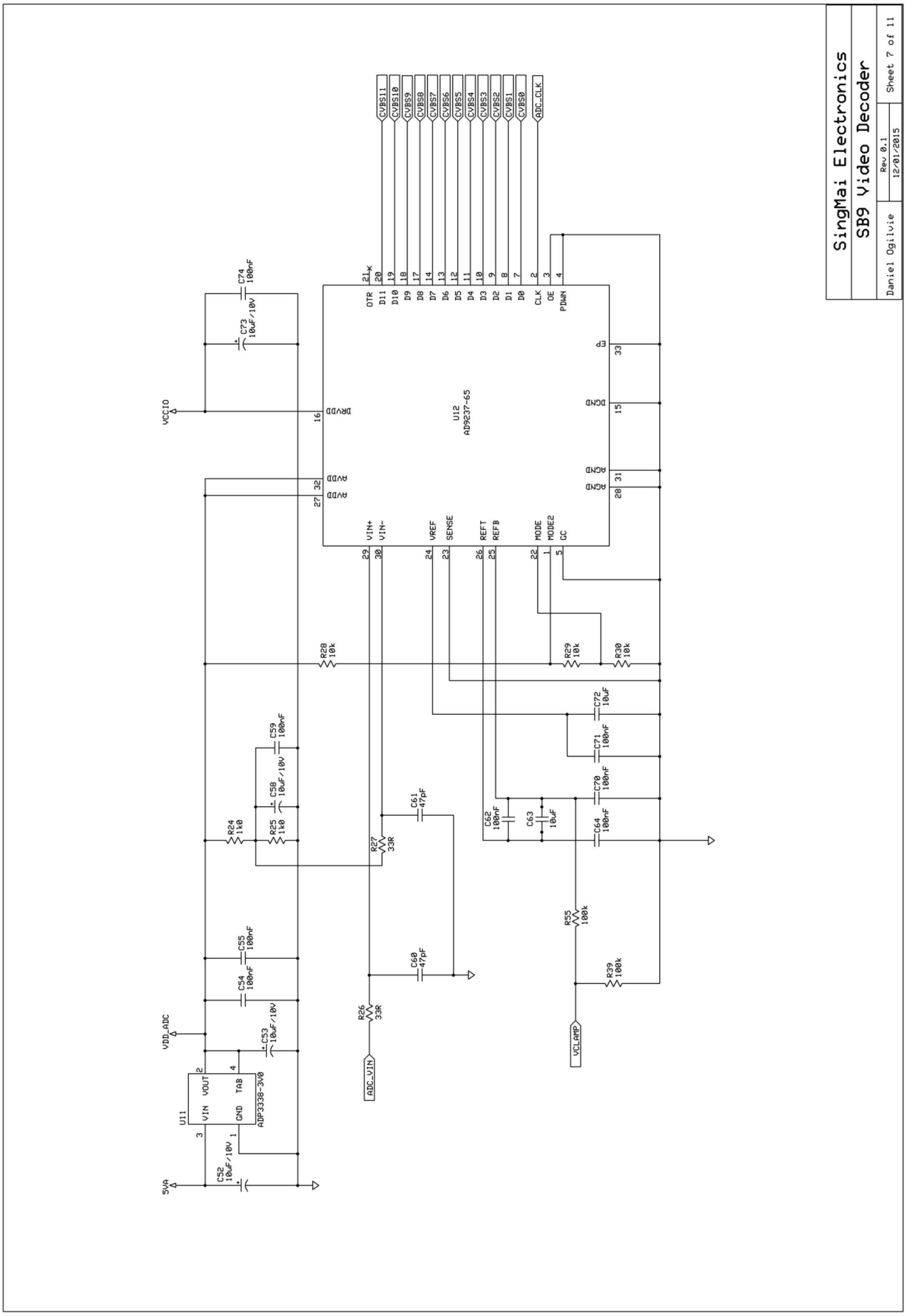


Figure 14 SB9 schematics - sheet 7.

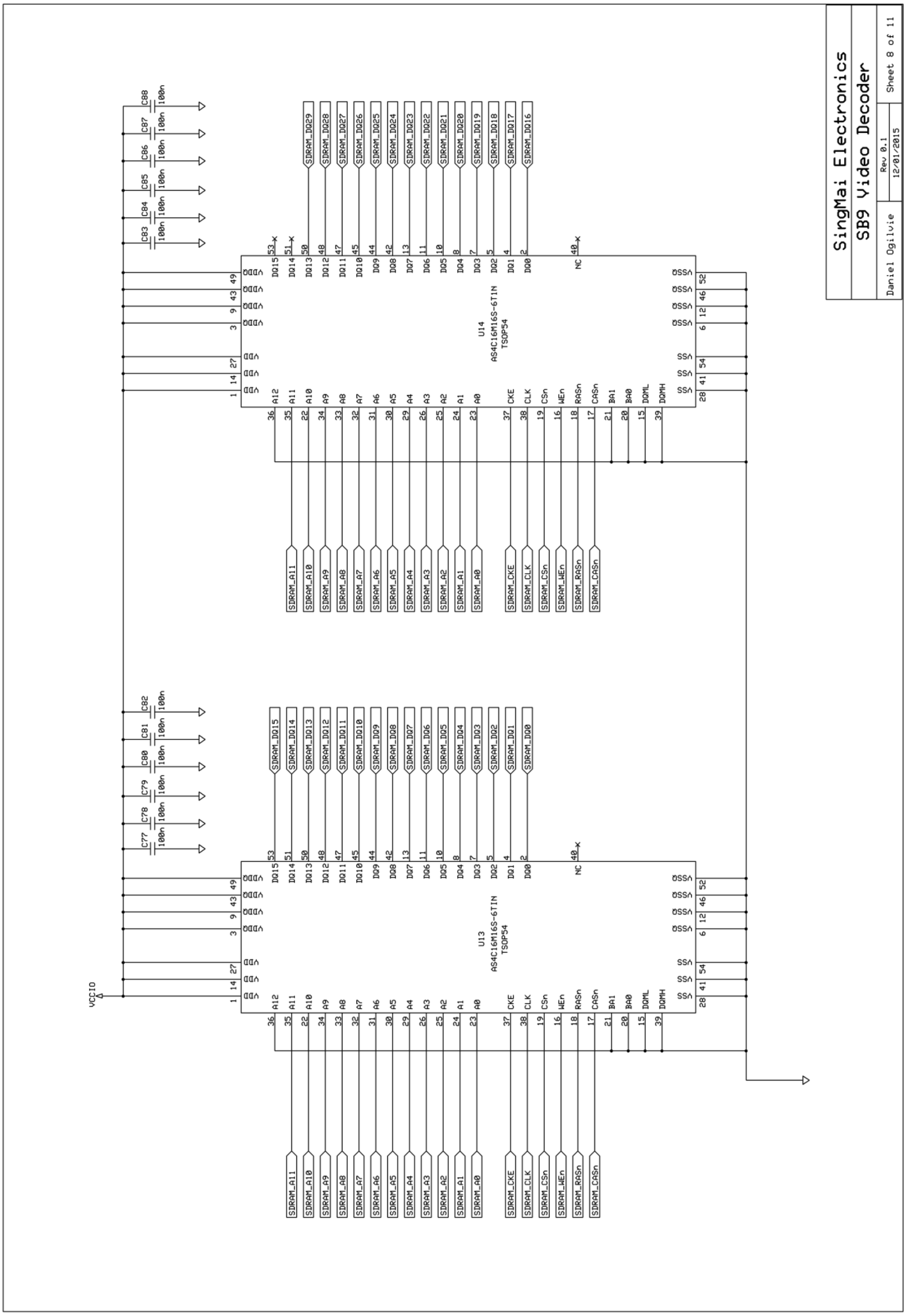


Figure 15 SB9 schematics - sheet 8.

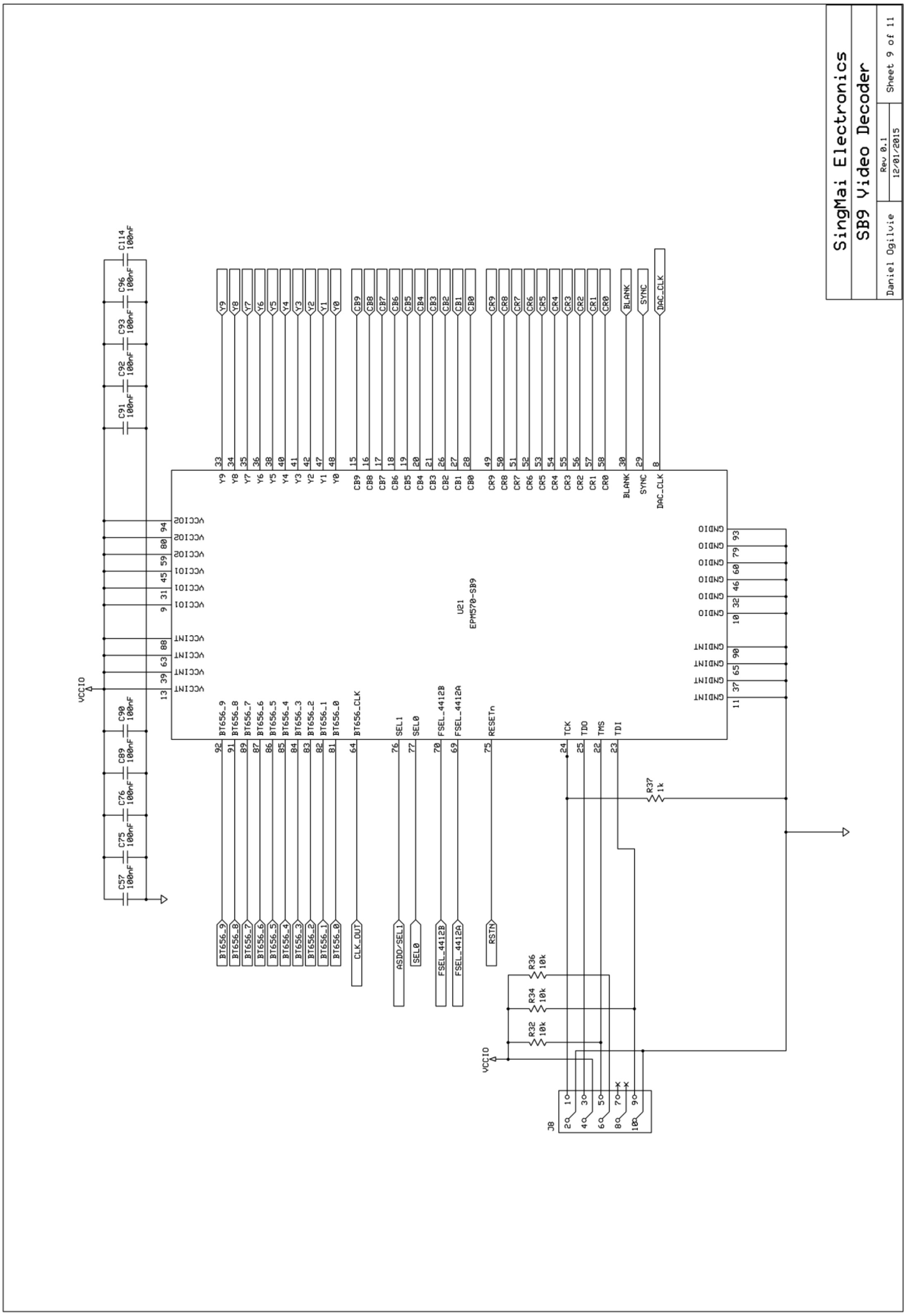


Figure 16 SB9 schematics - sheet 9.

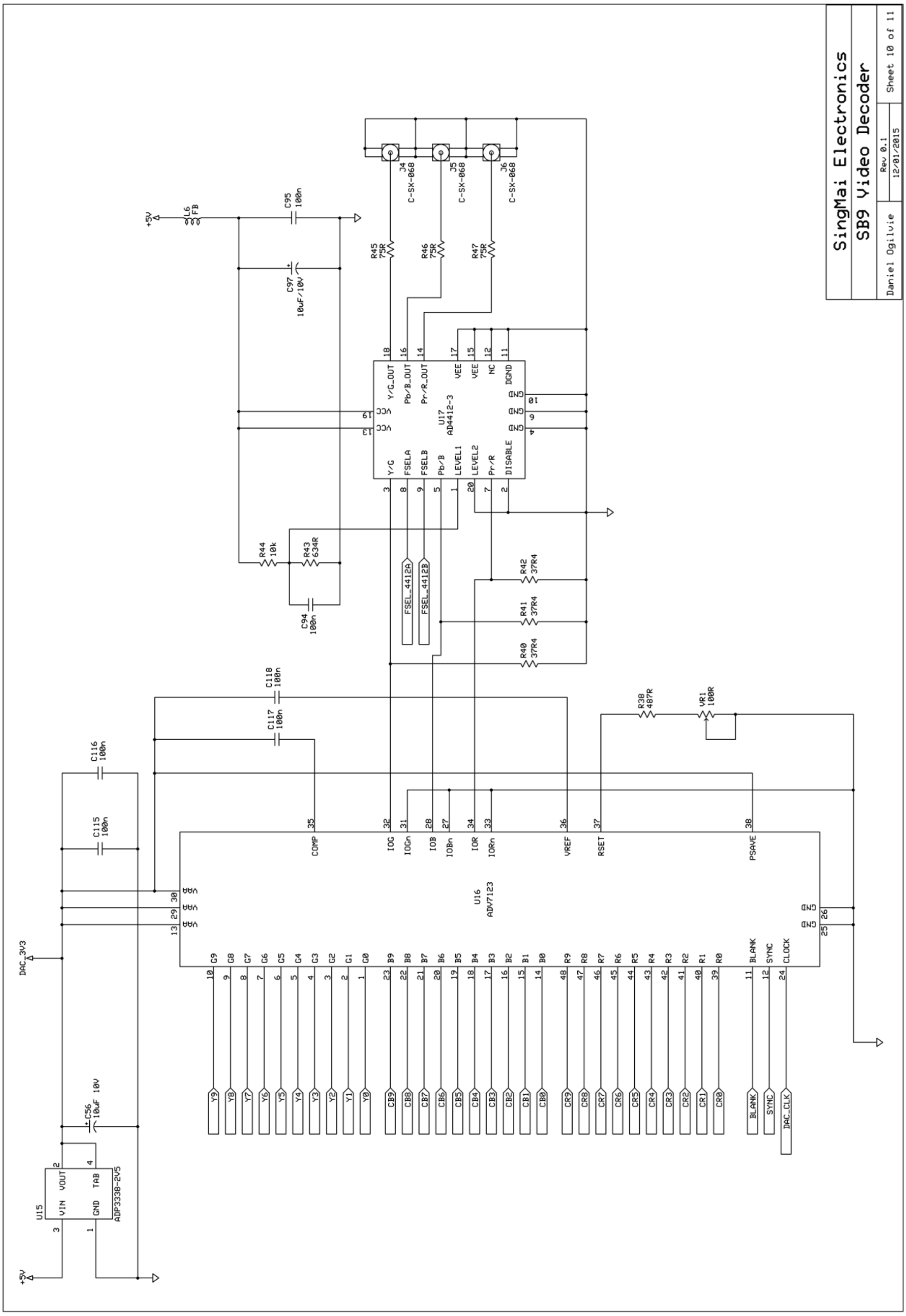


Figure 17 SB9 schematics - sheet 10.

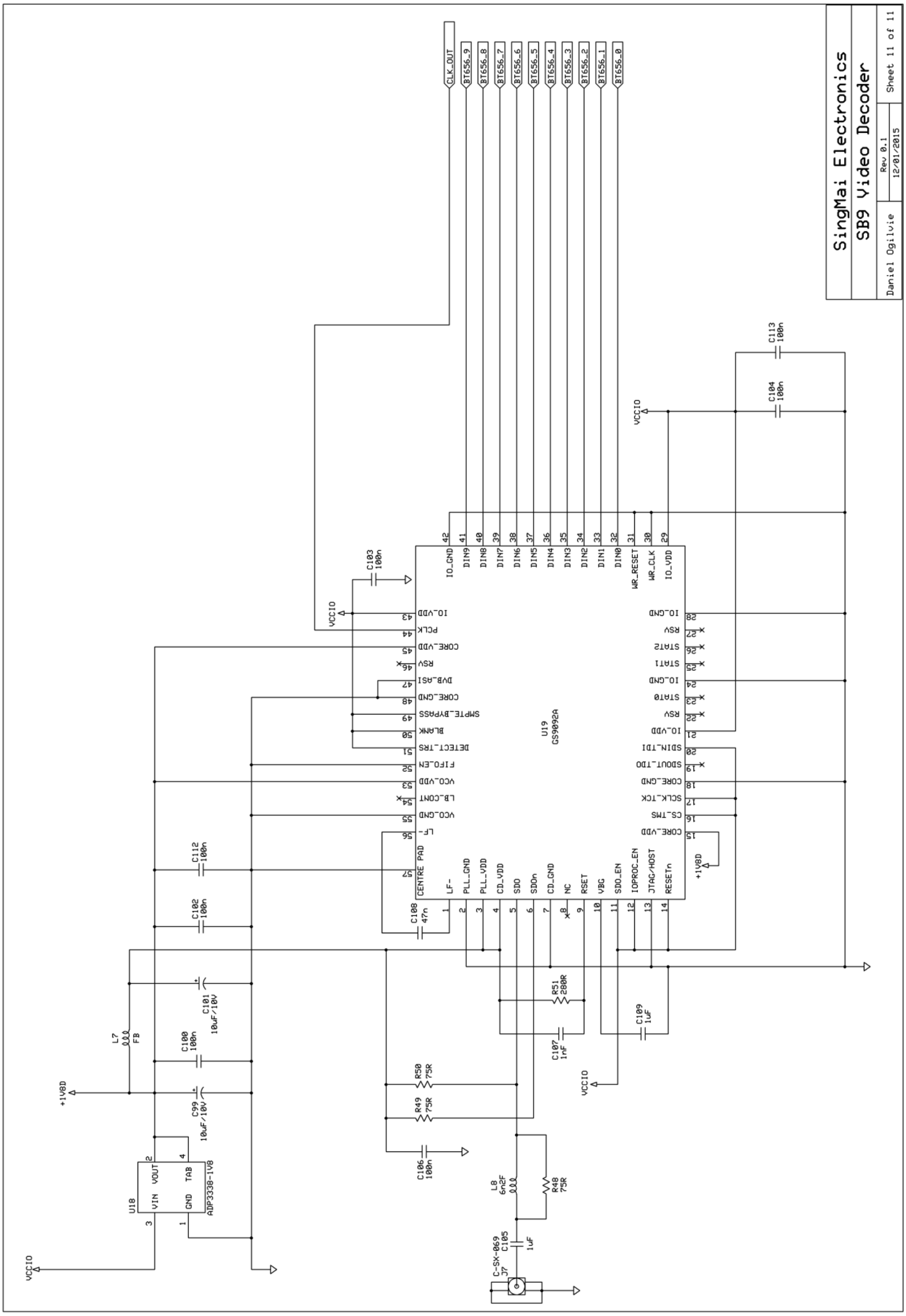


Figure 18 SB9 schematics - sheet 11.